

## CLAIMS

1. A catalyst for manufacturing synthesis gas containing carbon monoxide and hydrogen as principal ingredients from feedstock gas containing hydrocarbon having 1 to 5 carbon atoms in each molecule and oxygen, characterized in that

the catalyst for manufacturing synthesis gas has a carrier and a Group VIII metal carried by the carrier;

said carrier containing a first ingredient, a second ingredient and a third ingredient;

said first ingredient being an oxide of at least an alkaline earth metal selected from the group of magnesium, calcium, strontium and barium;

said second ingredient being an oxide of at least an element selected from the group of scandium, yttrium and lanthanoids;

said third ingredient being zirconia or a substance containing zirconia as principal ingredient and having a solid electrolytic property.

2. The catalyst according to claim 1, wherein the molar ratio of said second ingredient relative to said first ingredient is between 0.02 and 0.40 and the molar ratio of said third ingredient relative to said first ingredient is between 0.04 and 1.5.

3. The catalyst according to claim 1, wherein said first ingredient is magnesia or magnesia that contains calcia.

4. The catalyst according to claim 1, wherein  
5 said second ingredient is an oxide of at least an element selected from the group of scandium, yttrium, lanthanum, cerium, praseodymium, neodymium and samarium.

5. The catalyst according to claim 4, wherein  
10 said second ingredient is an oxide of cerium.

6. The catalyst according to claim 1, wherein said third ingredient is at least a substance selected from the group of zirconia, calcium-stabilized zirconia, magnesium-stabilized zirconia,  
15 yttrium-stabilized zirconia, scandium-stabilized zirconia and cerium-stabilized zirconia.

7. The catalyst according to claim 6, wherein said third ingredient is zirconia or calcium-stabilized zirconia.

8. The catalyst according to claim 1, wherein  
20 said carrier comprises a porous body that operates as substrate for the carrier and an overcoat film formed on the porous body by coating and said overcoat film contains said first ingredient, said  
25 second ingredient and said third ingredient.

9. The catalyst according to claim 8, wherein said porous body is made of at least a

substance selected from ceramic foam and ceramic honeycomb.

10. The catalyst according to claim 9, wherein said porous body is made of ceramic foam and  
5 has a mesh structure of 10 to 40 cells per inch.

11. The catalyst according to claim 9, wherein said porous body is made of ceramic honeycomb and has a structure of 100 to 400 cells per square inch.

10 12. The catalyst according to claim 1, wherein said Group VIII metal is at least a metal selected from the group of rhodium, platinum, palladium, ruthenium and iridium.

13. The catalyst according to claim 12,  
15 wherein

said Group VIII metal is rhodium.

14. The catalyst according to claim 1, wherein said Group VIII metal is carried by the carrier at a rate of 100 to 50,000 weight ppm per unit weight  
20 of the carrier.

15. The catalyst according to claim 1, wherein said Group VIII metal is carried by the carrier at a rate of  $2 \times 10^{-7}$  to  $5 \times 10^{-3}$  mol/m<sup>2</sup> per unit surface area of the carrier.

25 16. A method of manufacturing synthesis gas containing carbon monoxide and hydrogen as principal ingredients by causing feedstock gas containing

hydrocarbon having 1 to 5 carbon atoms in each molecule and oxygen to contact a catalyst for manufacturing synthesis gas, characterized in that

5       said catalyst for manufacturing synthesis gas has a carrier and a Group VIII metal carried by the carrier;

      said carrier containing a first ingredient, a second ingredient and a third ingredient;

10       said first ingredient being an oxide of at least an alkaline earth metal selected from the group of magnesium, calcium, strontium and barium;

      said second ingredient being an oxide of at least an element selected from the group of scandium, yttrium and lanthanoids;

15       said third ingredient being zirconia or a substance containing zirconia as principal ingredient and having a solid electrolytic property.

17.    The method according to claim 16, characterized in that

20       the molar ratio of said second ingredient relative to said first ingredient is between 0.02 and 0.40 and the molar ratio of said third ingredient relative to said first ingredient is between 0.04 and 1.5.

25       18.    The method according to claim 16, characterized in that,

      when the molar number of carbon deriving from

feedstock hydrocarbon is expressed by C, the ratio of  $O_2/C$  in the feedstock gas is within the range from 0.3 to 0.6, the gas temperature at the inlet of the catalyst layer filled with the catalyst for

5 manufacturing synthesis gas is so regulated as to be between 100 and 500°C and the gas temperature at the outlet of the catalyst layer is so regulated as to be between 600 and 1200°C while the gas pressure at the inlet of the catalyst layer is so regulated as to be  
10 between 0.1 MPa and 10 MPa.

19. The method according to claim 16,  
characterized in that

the contact time (t) is defined to be within a range between  $5 \times 10^{-4}$  and  $3 \times 10^{-2}$  sec.